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Two New Polydesmid Millipeds of the Genus *Epanerchodus* from Japanese Caves*

With 2 Text-figures

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(*Communicated by* M. UÉNO)

ABSTRACT Two new species of the genus *Epanerchodus* (Diplopoda) are described from Japan—*Epanerchodus okamotoi* n. sp. from Aichi Prefecture, and *E. porrectus* n. sp. from Kôchi Prefecture. Both the species are found in limestone caves, and show a close affinity with the known troglobiontic polydesmid members that occur in southwestern Japan.

Eleven, or possibly ten species of troglobiontic *Epanerchodus* have previously been reported from many caves in southwestern Japan and Okinawa. These troglobiontic species are very similar to one another in that the body is relatively small and always white in color. They are distinguished from the other members of the genus as the "Group V" (Miyosi, 1959, p. 94), which is, according to Miyosi's monograph, defined as follows: Body less than 14 mm in length; sensory prominence on the antennal joint 7 well developed; prefemur and tibia of each leg straight, and the spherical bristles on legs hardly developed; cavernicolous. So far as has been known to the author, lateral keels of typical segments are provided with minute strigils on the anterior margin, and with rows of microscopic tubercles on the posterior margin. Besides, posterior corners are somewhat extended in most of the sternites. These characters are of considerable importance to recognize this species-group.

Epanerchodus okamotoi n. sp.

(Japanese name: Ja-ana Obiyasude)

Diagnosis: A small troglobiontic species closely related to *E. yamatensis* Haga (1956, p. 337, pl. II, figs. 32 a-b) in the form of the body segments; easily distinguished from that species by the broader, lamellate accessory margin of the clivus of the male gonopod.

Male holotype: Color white. Length about 15 mm, greatest width 1.5 mm.

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Body slender and nearly of the same width from segment 6th to 17th; anterior segments smaller and narrower; dorsum slightly flat with weak sculpture. The shape of the head and of some selected segments are as shown in text-figures; their widths as follows:

Head =1.3 mm Collum=1.0 mm Seg. 2=1.2 mm
Seg. 3=1.1 mm Seg. 4=1.1 mm Seg. 5=1.3 mm
Seg. 10=1.5 mm Seg. 16=1.5 mm Seg. 18=1.3 mm.

Head large and densely covered with hairs. Antennae slender, approximately 2.5 mm long, nearly reaching the posterior border of segment 4 when extended over the dorsum; the ratio in length of joints 3 through 7 and in width of joints 5 through 7 (in parentheses) is 18 : 12 : 13(5) : 14(7) : 6(5.5); sensory groups on joints 5, 6 and 7 usually well developed. Collum elliptical, narrower than either the

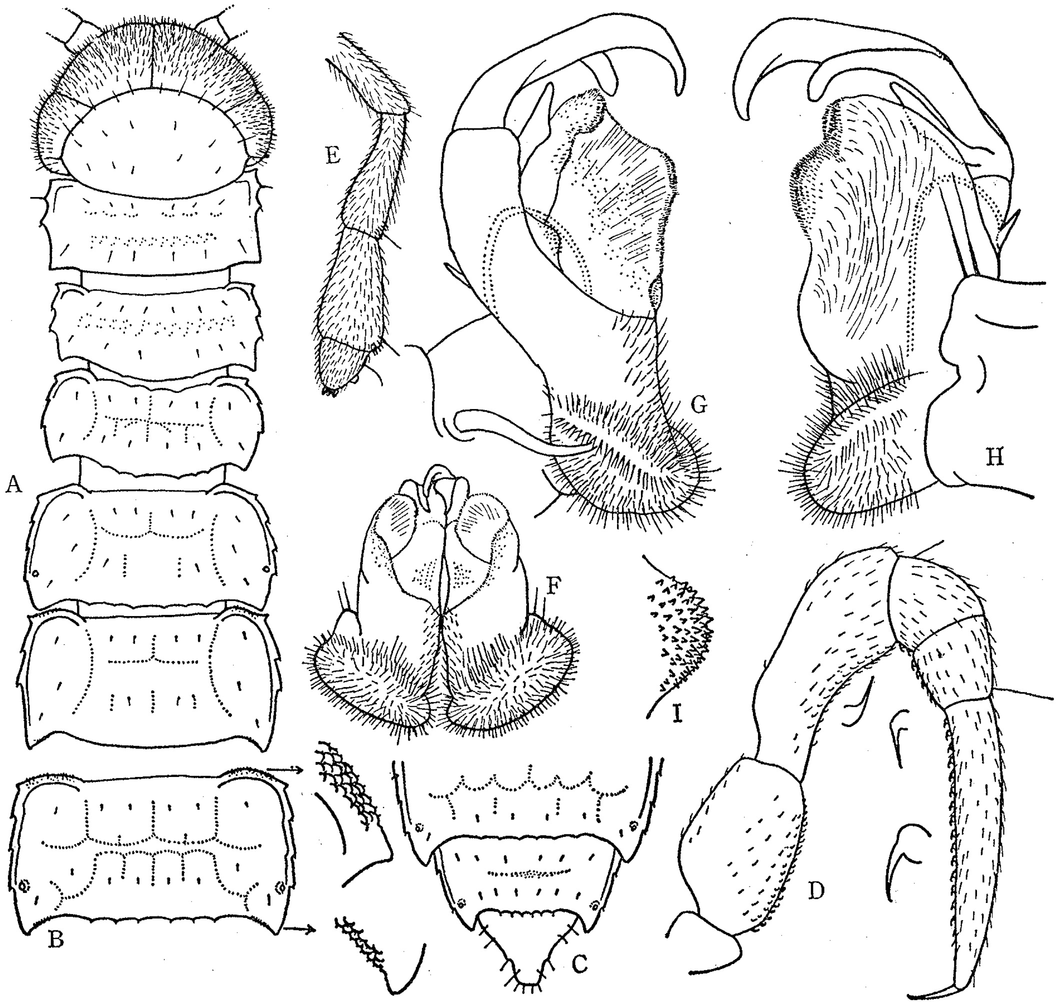

Fig. 1. *Epanerchodus okamotoi* n. sp., holotype. A, Head and six succeeding segments, dorsal aspect. B, Segment 10, dorsal aspect. C, Caudal end of body, dorsal aspect. D, Leg 10. E, Last three joints of antenna. F, Male gonopods, ventral aspect. G, Left gonopod, mesial aspect. H, The same, lateral aspect. I, Hair-cushion in clivus of gonopod.

head or the succeeding segments; each side with a minute bristle-bearing notch; a row of fine bristles present along the anterior margin and two rows on the surface. Second segment rectangular, dorsum nearly flat, with two rows of fine bristles, and posterior corners hardly produced. Succeeding segments each with the usual pattern of sculpture on dorsum, though it is rather weakly impressed; of this sculpture the third row obliterated; bristles on the dorsum finer than in *E. yamatensis*. Lateral keels moderately developed, narrower than long, and slightly reflexed; lateral margin weakly curved, with 3-4 minute bristle-bearing notches though less pronounced than in *E. yamatensis*; posterior angles moderately produced from segment 3, teeth of segment 19 small and short; anterior and posterior margins of segments 6 through 18 provided with several rows of minute tubercles bearing microscopic bristles. Pores very small, open on the dorsal surface near the fourth notch of pore-bearing keels. Sternites quadrate, with deep crossing furrow, and densely pubescent; from segment 8, the posterior corners produced into triangular knobs, which gradually become more conspicuous back to segment 18. Leg 10 not so slender; prefemur moderately protuberant on the upper side; tibia and tarsus with spherical bristles.

Gonopods relatively large, telopodites and distal ends of coxae exposed in ventral aspect; *in situ*, their tibiotarsi crossed at the terminal, prefemoral and femoral portion being in contact with each other, so that well developed clivi form a large cavity by themselves (Fig. 1, F). Femoral clivus much enlarged and lamellar, wholly strigose and with microscopic marginal hairs on the outer surface. The cavity large, with conspicuous hair-cushion, which is hemispherical and covered with minute processes. Seminal canal opens deep within cavity. Outer horn simple and small. Tibiotarsus falcate, strongly curved distally, and with a branch at the outer side. Postfemoral process short, spatulate, and projecting ventrad at the inner side of clivus.

Female paratype: Similar in size and appearance to the male except that the furrows on sternites are a little shallower and that the legs are slender, having no spherical bristles.

Variation: Body length varies from 11 to 14.5 mm in the male.

Type-series: 1♀, 25 May 1966, and 3♂♂, (including holotype), 1 larva, 31 January 1967, Ja-ana Cave (=Suse-dô Cave), Sengenshita, Suse-chô, Toyohashi, Aichi Pref. All these specimens were collected by Mr. Tsunehara Okamoto, and are preserved in the author's collection.

Epanerchodus porrectus n. sp.

(Japanese name: Mizuide Obiyasude)

Diagnosis: A small troglobiontic species very similar in appearance to *E. isikawai* Verhoeff (1941, p. 114, figs. 1-6), from which it can be distinguished by the following characters of the gonopod: Much elongated clivus, and the absence of outer horn and postfemoral process.

Male holotype: Color pure white. Length about 14 mm, greatest width about 1.4 mm. The widths of head and of some selected segments as follows:

Head =1.3 mm Collum=1.1 mm Seg. 2=1.1 mm

Seg. 3=1.0 mm Seg. 4=1.0 mm Seg. 5=1.2 mm
Seg. 10=1.4 mm Seg. 16=1.4 mm Seg. 18=1.2 mm.

Head large, densely covered with short hairs. Antennae slender, approximately 2.6 mm long, nearly reaching the posterior border of segment 4 when extended over the dorsum; the ratio in length and in width (in parentheses) of joints 5 through 7 is 13(5) : 13(7) : 7(5); sensory groups well developed. Collum a little narrower than head, semicircular, angulate at the posterior corners, and with a minute bristle-bearing notch at each lateral side; a row of bristles present along the anterior margin and two rows of fine bristles on the surface.

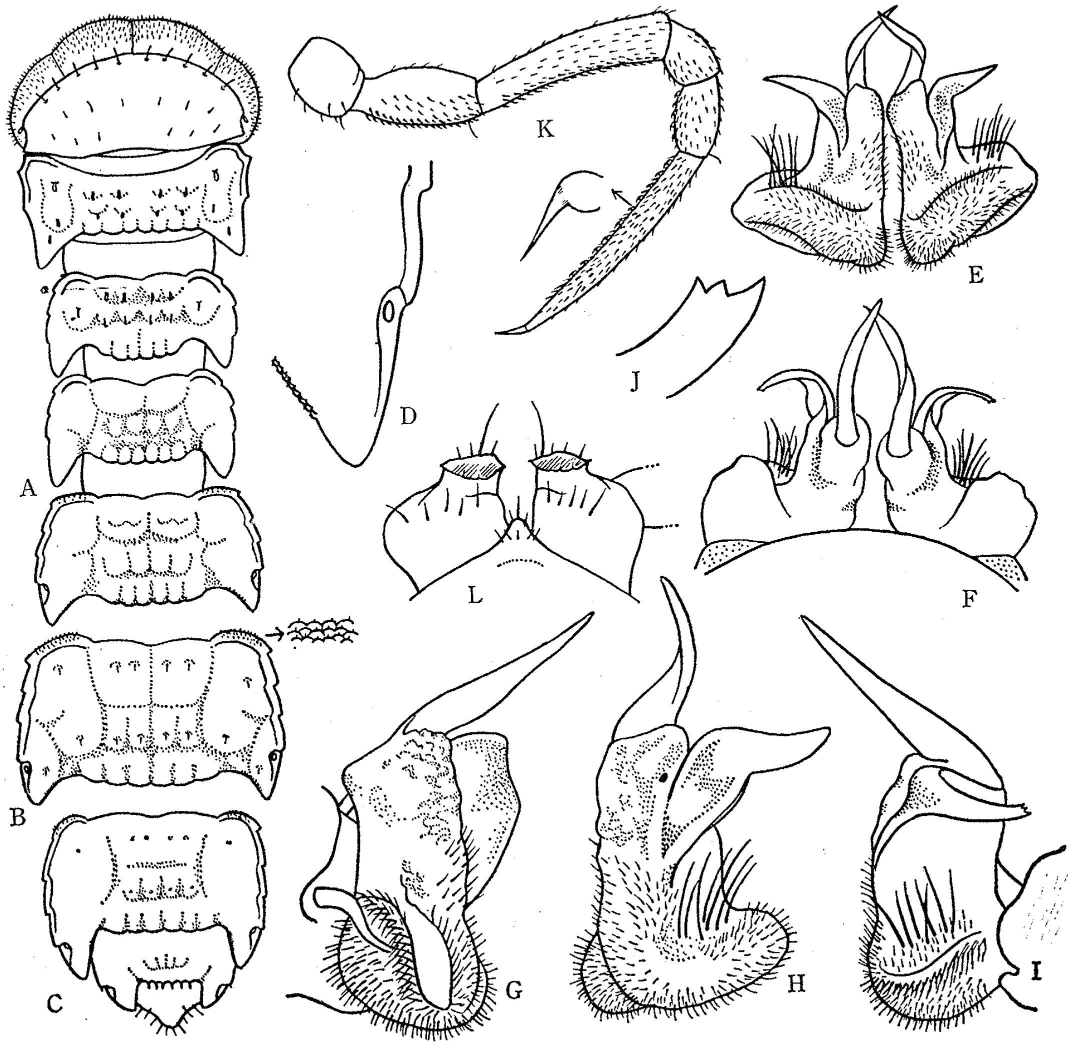

Fig. 2. *Epanerchodus porrectus* n. sp., holotype. A, Head and five succeeding segments, dorsal aspect. B, Segment 10, dorsal aspect. C, Caudal end of body, dorsal aspect. D, Posterior corner of lateral keel of segment 10. E, Male gonopods, ventral aspect. F, The same, anterior aspect. G, Left gonopod, mesial aspect. H, The same, ventral aspect. I, The same, lateral aspect. J, Distal end of clivus. K, 10th leg. L, Coxae of 2nd legs, anterior aspect.

Second segment transverse, as broad as collum, and with the posterior corners acutely produced; dorsal surface weakly impressed, with two rows of short bristles; outer margin of lateral keels straight. Succeeding segments with well impressed sculpture of the pattern usual for a member of the genus; the third row of sculpture usually somewhat projecting beyond the posterior margin of metatergites. Lateral keels well developed, rising slightly, the width being narrower than the length, and the posterior angle much pointed; anterior face and posterior margin of segments 5 through 18 provided with several rows of minute tubercles; teeth of keels of segment 19 long and parallel. Pores small, opening just behind the fourth notch on the lateral side. Sternites quadrate, pubescent, and deeply impressed transversely; posterior corners produced on segments 8 through 18. Legs slender; tibia and tarsus with small spherical bristles.

Gonopods as shown in the text-figure 2, E-J, differing in several particulars from those of *E. isikawai*; femur rugose in distal half, and dorsally angulate at the terminal corner, having no outer horn; very long, large process present at the terminal part of clivus in *porrectus*, but no such specialization is found in *isikawai*; post-femoral process wholly absent in the present species.

Female paratype: Length about 15 mm, width 1.7 mm. Other somatic characters as in the male.

Type-series: 1♂ (holotype), 10♀♀, 12 August 1966, 3♂♂, 5 May 1967, Mizuide-dô Cave, Shiroiwa, Higashi-sako, Kami-gun, Kôchi Pref. All the specimens were collected by the author, and are preserved in his collection.

Notes: In 1954 J. Ishikawa published a series of papers on the cave fauna of Shikoku. In the first part of this series, he recorded a milliped from Mizuide-dô Cave (p. 92), under the name of *Epanerchodus isikawai* Verhoeff. This may be due probably to a misidentification. Careful investigations made in recent years by the present author have yielded only the present new species. It is, however, so close to *E. isikawai* that the two species may easily be confused.

Acknowledgement

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